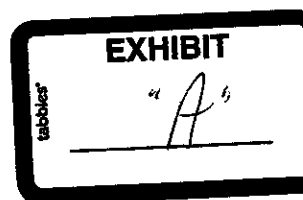


Dr.	James	Joyce
Professor of Geology	257 Calle Aduana	
PMB-194	Mayagüez	Puerto
Rico		00682
Tel/Fax 787-831-5856		

**Revised Silica Sand Extraction Volume Estimates
Juan Piza Blondet Property
Barrio Guarico Viejo, Vega Baja
Puerto Rico**

Submitted on behalf of
Juan Piza Blondet
To
Carlos Gastambide, MAI, MIE
Professional Real Estate Appraiser
Suite 1515 Banco Popular Center
Hato Rey, San Juan
Puerto Rico 00918



Introduction

A land parcel of about 33 acres or 34 cuerdas was expropriated from Juan Pizá by the Federal Aviation Administration for the construction of the Homer Beacon Facility. The land parcel is located about 1.0 kilometer east of Km.3.8 of PR 687 in the Yegada ward of Vega Baja, Puerto Rico. The expropriated land lies just southeast of Cerro Guarico and east of Barrio Guarico Viejo. The geologic map in Figure 1 shows that Cerro Guarico is composed of rocks of the Camuy Formation (Tca) and Aymamon Limestone (Tay) and that the expropriated property mainly consists of recent swamp deposits (Qs) and silica (quartz) sand deposits (Qss). The silica sand deposits cover nearly half of the property and are limited to areas between 1-3 meters in elevation. The swamp deposits cover the remainder of the area and occur in the wetlands that lie below 1 meter of elevation.

Silica sands are a valuable industrial resource that is used extensively in the glassmaking industry. The primary consumer of silica sand in Puerto Rico is Owens Illinois Company. Prior to the expropriation of the Pizá property, the owner had petitioned and received extraction permission (permiso simple) from the Puerto Rico Department of Natural Resources for a site west of PR 687. It is the primary intention of this report to estimate as accurately as possible the permissible quantity of silica sand that could have been extracted from the site had it not been expropriated. This information can then be used to evaluate the true property value of the expropriated property.

Silica Sand Deposits

The silica sand deposits on Puerto Rico are very pure quartz sands that form as a residual soil left behind by the weathering and leaching of quartz rich marine terrace and shoreline deposits. The formation of the sand is a two-stage process. First weathering of the ancient shoreline sandstones. This process dissolves the calcareous sand and changes other rock and mineral fragments into clay and iron hydroxides. Because quartz is largely unaffected by these weathering processes it remains behind in the residual "blanket deposit" that essentially consists of sandy (quartz), iron rich clay. Leaching out of the clay and iron in the blanket deposit by water infiltrating through soil leaves behind loose, pure quartz sand on the surface and in the subsurface. The residual silica sand is usually on the order of 2 meters thick and irregularly distributed over the blanket deposits. The thickest and most extensive silica sand deposits occur to the south and east of Laguna Tortugero. The advanced development of the sand here maybe related to the artesian ground waters that feed the Laguna. The silica sand deposits in the expropriated property are part of the Laguna Tortugero deposits.

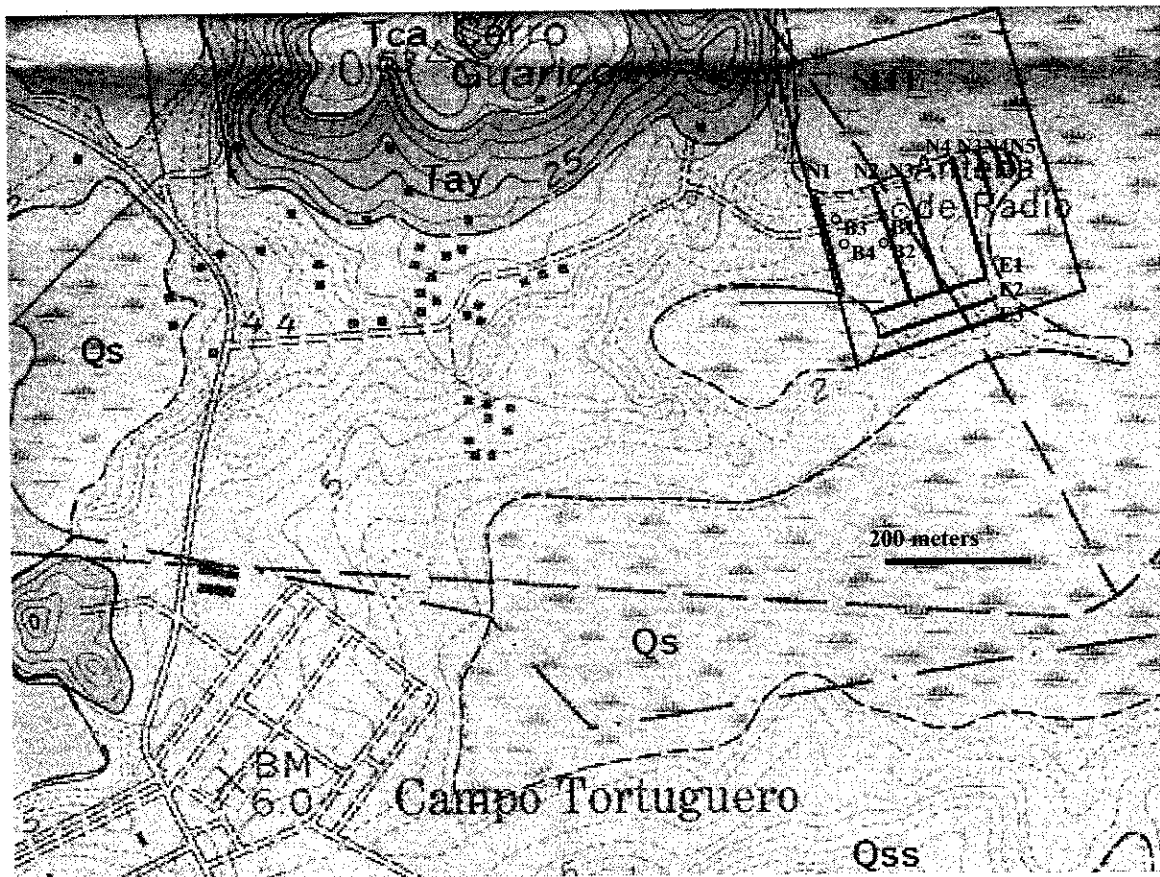


Figure 1 Geologic Map of the Manati Quadrangle

Evaluation of Silica Sand Distribution

The geologic map shows that the silica sand covers all of the site area above 1-meter elevation and states that the thickness of these deposits ranges from 1-4 meters. The exposure of the sand in mounds or dunes around the site indicates thickness of at least 2 meters. However as the topography only varies from 1-3 meters it is impossible to estimate the actual thickness from surface exposures. In order to better evaluate the thickness of the silica sand deposits

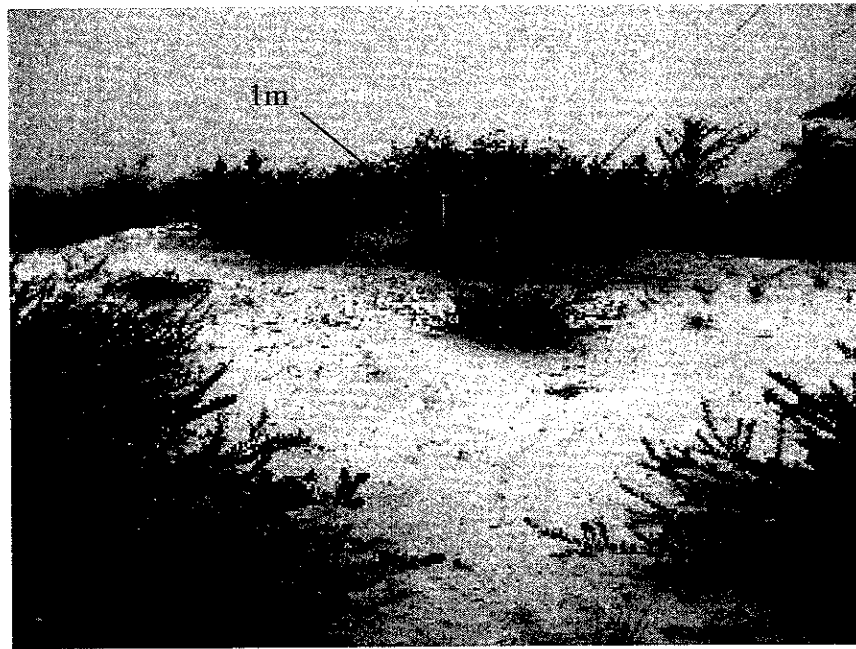


Photo 1 Mounds or dunes of silica sand east of antenna
sand

below the site, 4 soil borings were drilled at the north side of the site near the access road. The borings were sampled continuously to

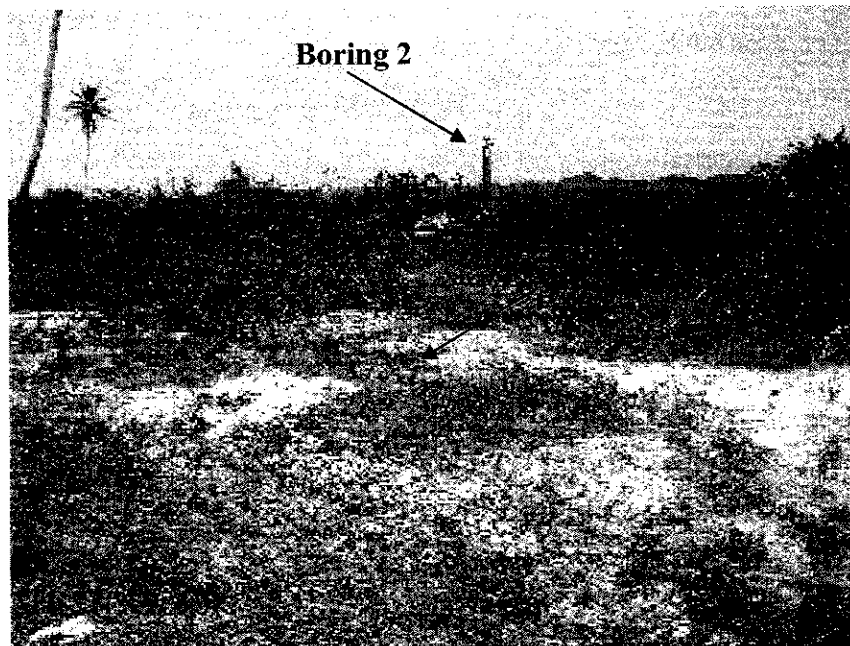
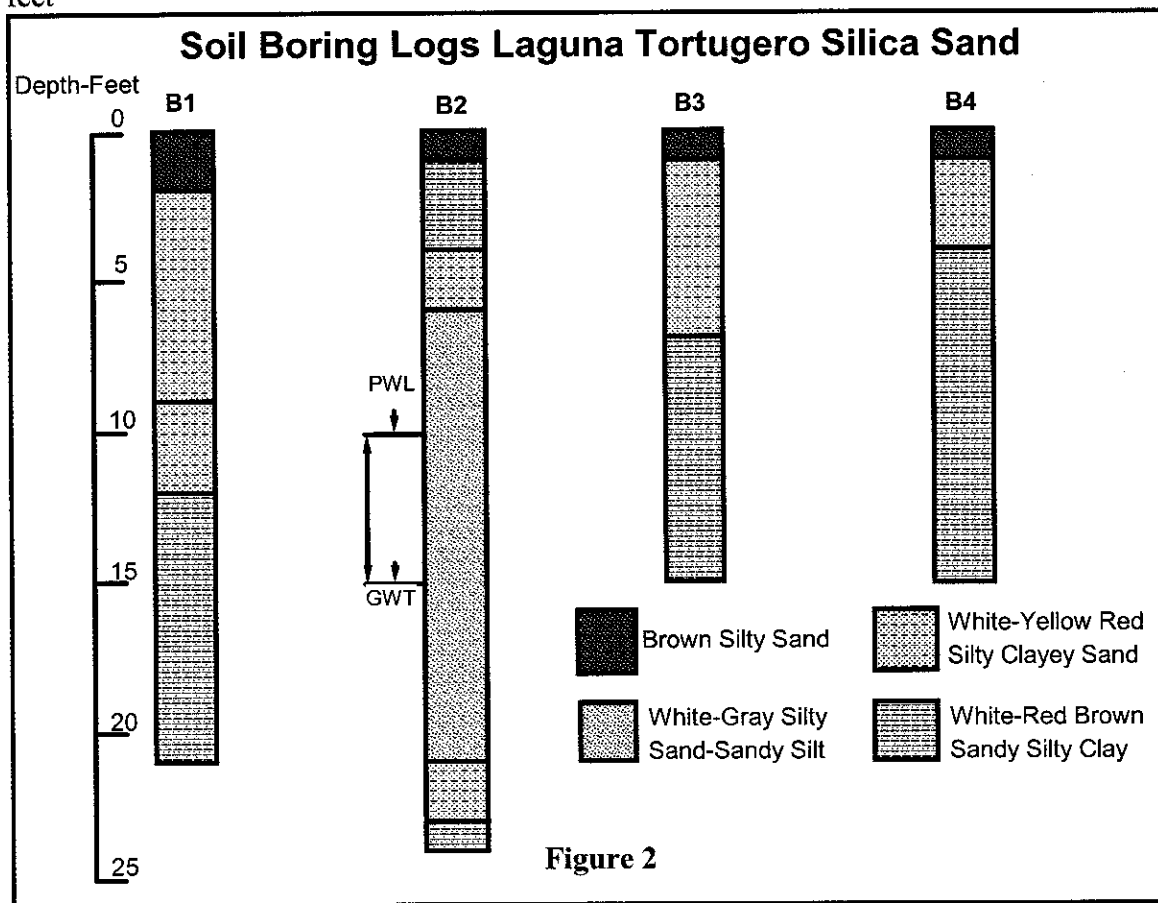


Photo 2 Loose silica sand along the access road

depths ranging from 15 to 24 feet. The thickness of silica sand in the soil borings varied greatly (Figure 2). B1 consisted of 12 feet of silty clayey sand overlying stiff sandy clay. B2 consisted of 23 feet of mainly silty sand overlying hard sandy clay. B3 consisted of 7-8 feet of silty and clayey sand overlying sandy clay. B4 only had 3-4 feet of silty clayey sand overlying sandy clay. Groundwater was only encountered in B2 at an elevation of

15 feet in silty sand. The water level in the boring eventually rose to a level of about 10 feet



Inspection of the samples indicated the sand was pure quartz and mainly mixed with gray silt and clay. Although the sandy clay contains abundant quartz sand it is bound in sticky clay and not retrievable for exploitation. Boring 2 lies at the edge of the low-lying area south of the access road. This low area is characterized by wetland depressions that may be associated with groundwater in the thicker silty silica sand deposits that characterize Boring 2. This suggests thicker sand deposits underlie the low area. Borings 3 and 4 lie on the higher land along the eastern edge of the property and contained the least thickness silica sand. Observation of the land area around Boring 3 suggests 1-2 meters of sand has been previously excavated from here. Boring 4 lies along the north side of access road, where the sands may also have been previously excavated and replaced with fill for the road. The limited silica sand thicknesses encountered in these borings are therefore probably not representative of the site. Boring 1 lies in the higher area near to the antenna and showed a silica sand thickness of 12 feet or 3.65 meters. This thickness is probably representative of the higher areas of the site. Interpretations of silica sand thickness below the site are shown on the profiles in Figure 3.

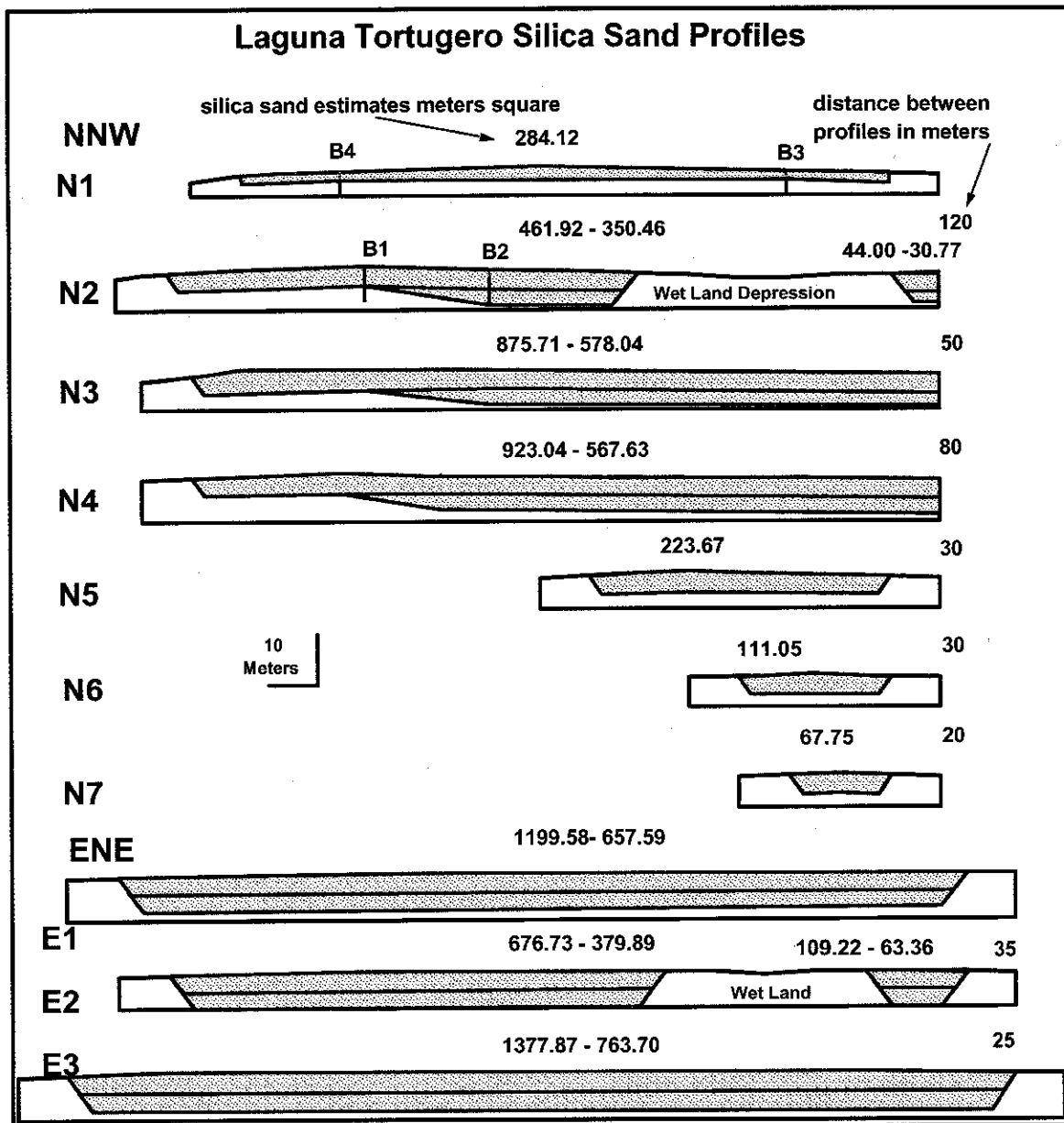


Figure 3

Estimation of Extractable Sand Volume

The sand volume estimations are based on the interpretation of silica sand thicknesses presented in Figure 3. The sand resource is limited to silty sand, sandy silt and silty-clayey sand soils. Extraction permits require that the sand extraction not extend into the adjacent wetlands. A 10-meter buffer zone was left between the estimated extraction areas and adjacent wetlands in accordance with typical restrictions imposed under the extraction permit. The limit of the wetlands was established as the 1-meter topographic contour line on the geologic map (Figure 1). The area of extractable sand resource below each of the topographic profiles is marked in red and shown above each profile as computed in cubic meters. Two different areas are shown for the profiles across

the low-lying area south of the access road (N2, N3, N4, E1, E2, E3). The two different estimates are based on whether the thickness of the silica sand in the low-lying area is 7 meters as in Boring 2 or is 3.65 meters as in Boring 1. A thickness of 3.65 meters is more typical for the silica sand deposits and probably represents a more realistic estimate. The estimate using 7-meter thickness yields the maximum possible extraction estimate.

The total volume of extractable sand was computed by summing the estimated volumes between adjacent profiles. The areas of adjacent profiles were averaged and then multiplied by the distance between the profiles. The volume estimates are presented in Table 1. A minimum possible extraction estimate was also computed for the site based on a minimal thickness of 2 meters of silica sand throughout the entire site area. Two sets of profiles were constructed. The N profiles cover the expropriated area marked on the geologic map by Dames & Moore Lebron LLP. The E profiles were included to cover the expropriated area as shown on the land use map of Dames & Moore Lebron LLP which was the map used to determine actual expropriated acreage.

The maximum possible sand extraction potential for the expropriated property is estimated as 235,957.13 cubic meters. The most probable sand extraction potential is estimated as 162,759.43 cubic meters. The least possible sand extraction is estimated as 92,125.00 cubic meters. The errors due to the limited resolution of the 1:20,000 geologic map used to measure the profiles were estimated as 540, 280 and 220 cubic meters respectively.

MODEL 1 Maximum possible sand extraction potential					
Profile	length	area	Average	Distance	Volume
NNW-1	135	284.12			
NNW-2	105	461.92	373.02	120.00	44762.40
NNW-3	150	875.71	668.82	50.00	33440.75
NNW-4	150	923.04	899.38	80.00	71950.00
NNW-5	40	223.67	573.36	30.00	17200.65
NNW-6	30	111.05	167.36	30.00	5020.80
NNW-7	20	67.75	89.40	20.00	1788.00
ENE-1	170	1199.58			
ENE-2	120	785.95	992.77	35.00	34746.78
ENE-3	185	1377.87	1081.91	25.00	27047.75
				TOTAL	235957.13
MODEL 2 Most probable sand extraction potential					
Profile	length	area	Average	Distance	Volume
NNW-1	135	284.12			
NNW-2	105	381.23	332.68	120.00	39921.00
NNW-3	150	578.04	479.64	50.00	23981.75
NNW-4	150	567.63	572.84	80.00	45826.80
NNW-5	40	223.67	395.65	30.00	11869.50
NNW-6	30	111.05	167.36	30.00	5020.80
NNW-7	20	67.75	89.40	20.00	1788.00
ENE-1	170	657.59			
ENE-2	120	443.25	550.42	35.00	19264.70
ENE-3	185	763.7	603.48	25.00	15086.88
				TOTAL	162759.43
MODEL 3 Minimum possible sand extraction potential					
Profile	length	area	Average	Distance	Volume
NNW-1	135	270			
NNW-2	105	210	240.00	120.00	28800.00
NNW-3	150	300	255.00	50.00	12750.00
NNW-4	150	300	300.00	80.00	24000.00
NNW-5	40	80	190.00	30.00	5700.00
NNW-6	30	60	70.00	30.00	2100.00
NNW-7	20	40	50.00	20.00	1000.00
ENE-1	170	340			
ENE-2	120	240	290.00	35.00	10150.00
ENE-3	185	370	305.00	25.00	7625.00
				TOTAL	92125.00

Silica Sand Extraction Permits

Extraction of silica sand from the site would require obtaining permits from the DRNA (Dept. of Natural Resources and Environment). The DRNA Regulations Controlling the Extraction Excavation, Removal or Dredging of Earth Materials of December 2004 defines the required permits.

A Simple Permit (Sec. 2.47, "Permiso Simple") is defined as authorization emitted by the Secretary or authorized agent for small-scale excavation extraction or removal of earth materials, either for commercial or noncommercial purposes, up to a limit 1,000 cubic meters for sand and 5,000 cubic meters for other earth materials. Section 4.1 covers applicability and states that if the intended use of the excess material is commercial sales then the activity should be authorized under a formal permit. Section 4.2 covers required submittals; #9 states that if excess material is to be removed from the site and deposited elsewhere, a sworn statement is required from the recipient as well as any other applicable or corresponding authorizations. The present regulations leave open the possibility to sell silica sand as excess material when the extraction permit was granted for purposes other than commercial exploitation of the sand.

A Formal Permit (Sec. 2.45, Permiso Formal) is defined as authorization emitted by the Secretary or authorized agent for excavation extraction, removal and dredging of earth material components on a large scale or for commercial purposes, or when the magnitude or complexity of the operation merits a rigorous major technical and legal evaluation or study, whether or not it is for commercial purposes. The basic form of the permit for silica sand extraction requires an environmental evaluation, soil borings of 15 feet deep no more than 100 meters apart, and limits extraction to the depth of the phreatic or ground water level and to within 10 meters of the adjacent wetlands as delineated by the COE (U.S. Army Corps of Engineers).

Permission to extract silica sand below the ground water level requires a complete Environmental Impact Statement, analysis of groundwater flow pattern and potential impact on any water wells within 500 meters. Sand extraction pits are limited in size to less than 1200 square meters and in depth to 4 meters below the groundwater level and must be at least 10 meters away from adjacent wetlands as delineated by COE. The extraction pits must be filled with limestone or igneous-volcanic rock simultaneous with extraction and the location of the intended fill material must be documented in the permit application.

The site conditions are and were at the time of taking overall favorable to obtain silica sand extraction permits. The Laguna Tortuguero Reserve lies about 1 kilometer away from the site and is separated by a topographic high greater than 5 meters. Therefore any development or extraction at the site would have no impact on the nature preserve. The required 10 meter buffer zone would restrict any impact on the adjacent wetland areas. The boundary between the two is clearly defined by an abrupt change in vegetation and soil as seen in photo 3 below.

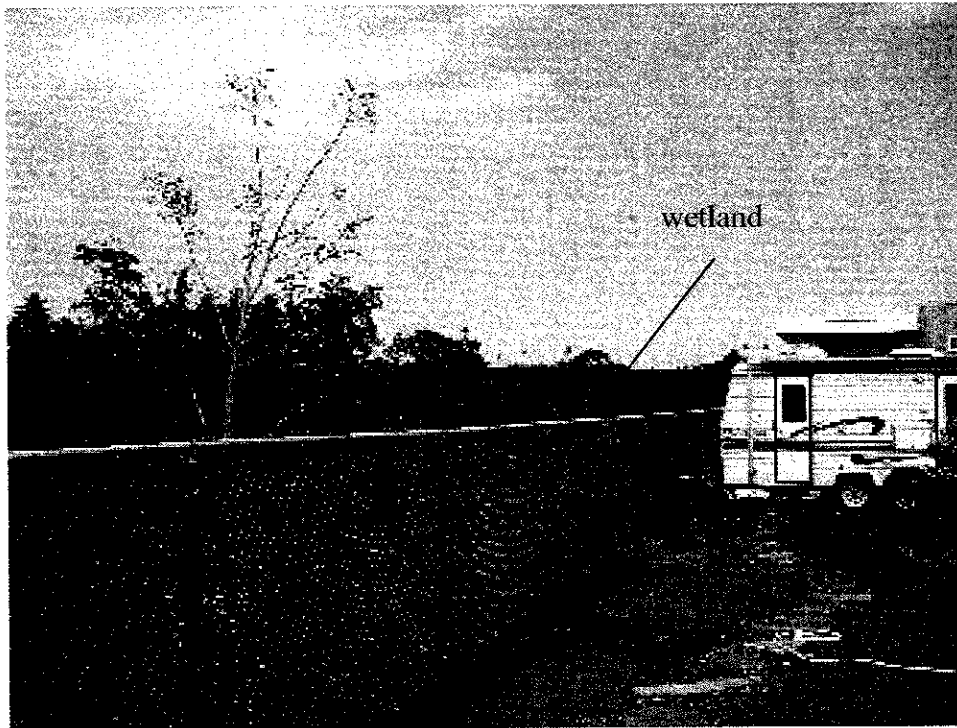


Photo 3 House at the edge of wetlands west of the antenna site

In terms of impact on the environment sand extraction would have no more impact than the development of housing (photo 3). In fact, because the site lies in flood zone 2, DRNA would require filling above flood water levels before development of housing at the site. Extraction of the sand prior to filling would therefore produce no further impact to the environment. There is ample limestone fill material on the property in Cerro Guarico either for the flood prevention filling or to fill the extraction pits if permission was granted to extract below the ground water level. Probably the greatest impact of extraction of the silica sand at the site would be the displacement of botanical species that have evolved on and are restricted to the silica sand soils. This problem could be mitigated by a restoration plan that emplaced a layer of the unusable sandy clay above the limestone fill. The clay will filter down into the limestone and leave behind a silty sand soil that could be re-colonized by the displaced plants.

Permissible Extraction Volumes and Sales Potential

The silica sand extraction volume estimates generated here in Table 1 largely conform to DRNA permit restrictions. A simple permit allows for extractions up to 100,000 cubic meters. Thus the minimal estimate of 92,125 cubic meters could potentially be extracted with that type of permission. A formal permit would allow for the most probable extraction potential estimate on Table 1 of 162,759 cubic meters. This extraction estimate is based the silica sand resource that lies above the groundwater table. A formal permit with permission to extract below the groundwater table would allow for the maximum possible sand extraction estimate of 235,957. There is no doubt that which ever quantity was extracted it would all be purchased by Owens Illinois for glassmaking. At the time of taking Owens Illinois was actively seeking silica sand, which is the

primary ingredient in its manufacturing process. In 1995 the company awarded the Dept. of Geology at UPR-Mayaguez a grant entitled "Quartz sands of Puerto Rico: A proposal to expand the existing reserve of raw material for the production of glass" to help them find more available silica sand resource. The necessity for silica sand in the Owens Illinois glass manufacturing process persists and they remain active in pursuing new resources of the material.

Conclusions

1. About half of the expropriated Pizá property is covered and underlain by silica sands. These sands are a valuable and exploitable resource.
2. Expropriation of the property for the construction of the FAA facility precluded exploitation of the silica sand deposits.
3. The silica sand in the property is part of the extensive and thick Laguna Tortuguero silica sand deposits.
4. Soil borings and field observations at the property site indicate silica sand thickness ranging from 2 meters to 7 meters.
5. The permissible silica sand extraction volume estimates based on interpreted soil profiles ranged from a maximum of 235,957 cubic meters to a minimum of 92,125 cubic meters.
6. The most probable, best estimate of extractable silica sand volume that would be permissible is 162,759 cubic meters. This is a reasonable estimate to be used in determining the true value of the expropriated property for just compensation.
7. Owens Illinois was an active consumer of silica sand at the time of taking and remains so at present. They would have gladly purchased all of the extracted silica sand for glass manufacturing either before or after the time of taking.

Respectfully Submitted

James Joyce PhD, PG
2/9/2005